WHAT IS CLAIMED IS:

1. A method for calculating an HMM output probability, comprising:

using a noncorrelative normal distribution as an output-probability distribution, in which, when an input vector at a time is represented by Y (Y has n-dimensional components, and n is a positive integer), dispersion in k dimensions (k is any natural number from 1 to n) in the case of states i to j is represented by σij(k), and an average in the k dimensions in the case of states i to j is represented by μij(k), a formula for finding the output probability being provided by: expression 1:

$$b_{ij}(Y) = \prod_{k=1}^{n} \left(\frac{1}{2\pi\sigma_{ij}(k)^2} \right)^{\frac{1}{2}} \cdot e^{-\sum_{k=1}^{n} \left[\frac{\{y_k - \mu_{ij}(k)\}^2}{2\sigma_{ij}^2(k)} \right]} \quad (1)$$

using the logarithms of both sides thereof, by: expression 2:

$$\log_x b_{ij}(Y) = \underbrace{\log_x \left[\prod_{k=1}^{n} \left(\frac{1}{2\pi\sigma_{ij}^2(k)} \right)^{\frac{1}{2}} \right]}_{A} - \underbrace{\overbrace{\sum_{k=1}^{n} \left[\frac{\{y_k - \mu_{ij}(k)\}^2}{2\sigma_{ij}^2(k)} \right]}^{B'} \cdot \log_x e}_{B} \quad (2)$$

reducing the number of calculations of a calculation term represented by [{yk-μij(k)}2]/2σij(k)2•logxe in expression (2) by:

creating code books in which the values in dimensions of input vector Y at a time are represented by sets of representative values;

substituting the values in the dimensions (first to n-th dimensions) of input vector Y at said time by codes existing in said code books;

finding, based on the codes, the calculation term represented by [{yk-μij(k)}2]/2σij(k)2•logxe by referring to tables;

creating said tables for sets formed, such that among the first to n-th dimensions, dimensions capable of being treated as each set being collected, and in the table for each set, output values, found based on codes selected for the dimensions existing in the set, being found as total output values for combinations of all the

codes, and the combinations of the codes being correlated with total output values obtained thereby;

based on the codes selected for the dimensions corresponding to one set, by referring to said tables, obtaining the total output values which correspond to the combinations of the code for the dimensions; and

calculating the output probability based on the total output values.

2. The method for calculating an HMM output probability as set forth in Claim 1, further including: when the numbers of codes in the dimensions in collections of the dimensions capable of being treated as each set are allowed to differ, collecting dimensions having identical numbers of codes to form each set.

3. A speech recognition apparatus, comprising:

a characteristic analyzer which performs characteristic analyses on an input speech signal and which outputs an input vector at each point of time and components composed of a plurality of dimensions;

a scalar quantizer which replaces the components by predetermined codes by performing scalar quantization on received components for the dimensions from said characteristic analyzer;

an arithmetic processor which finds an output probability by using output values obtained by referring to tables which are created beforehand and uses the output probability to perform the arithmetic operations required for speech recognition; and

a speech-recognition processor which outputs the result of performing speech recognition based on the result of calculation performed by said arithmetic processor,

said tables being created for sets formed such that among the first to n-th dimensions, dimensions capable of being treated as each set are collected, and in the table for each set, output values, found based on codes selected for the dimensions existing in the set, being found as total output values for combinations of all the codes, and the combinations of the codes are correlated with total output values obtained thereby; and

based on the codes selected for the dimensions corresponding to one set, by referring to said tables, said arithmetic processor obtaining the total output values which correspond to the combinations of the code for the dimensions and calculating the output probability based on the total output values.

4. The speech recognition apparatus as set forth in Claim 3, when the numbers of codes in the dimensions in collections of the dimensions capable of being treated as each set are allowed to differ, dimensions having identical numbers of codes being collected to form each set.

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